

**FINAL DECISION DOCUMENT  
FOR THE INTERIM RESPONSE ACTION FOR  
THE CLOSURE OF ABANDONED WELLS AT  
ROCKY MOUNTAIN ARSENAL**

JUNE 1988

**U.S. ARMY PROGRAM MANAGER'S OFFICE FOR  
ROCKY MOUNTAIN ARSENAL CONTAMINATION CLEANUP**

**THE USE OF TRADE NAMES IN THIS REPORT DOES NOT CONSTITUTE AN  
OFFICIAL ENDORSEMENT OR APPROVAL OF THE USE OF SUCH  
COMMERCIAL PRODUCTS. THE REPORT MAY NOT BE CITED FOR  
PURPOSES OF ADVERTISEMENT**

DTIC QUALITY INSPECTED 3

19960828 012

**FINAL DECISION DOCUMENT  
ABANDONED WELLS CLOSURE**

**TABLE OF CONTENTS**

<b>1.0 <u>INTRODUCTION</u></b> .....	<b>1</b>
<b>2.0 <u>HISTORY OF RMA WELLS</u></b> .....	<b>2</b>
<b>3.0 <u>INTERIM RESPONSE ACTION OBJECTIVES</u></b> .....	<b>3</b>
<b>4.0 <u>INTERIM RESPONSE ACTION ALTERNATIVES</u></b> .....	<b>4</b>
<b>5.0 <u>CHRONOLOGY OF EVENTS FOR THE ABANDONED WELL IRA</u></b> .....	<b>7</b>
<b>6.0 <u>SUMMARY OF THE INTERIM RESPONSE ACTION PROJECT</u></b> .....	<b>8</b>
<b>7.0 <u>IRA PROCESS</u></b> .....	<b>12</b>
<b>8.0 <u>ARARs</u></b> .....	<b>13</b>
8.1 <u>ATTAINMENT OF ARARs</u> .....	13
8.2 <u>IDENTIFICATION AND SELECTION OF ARARs</u> .....	13
8.3 <u>SELECTION OF ARARs AND DETERMINATION OF ARAR IMPACT</u> ..	13
8.3.1 <u>Ambient- or Chemical-Specific ARARs</u> .....	13
8.3.2 <u>Location-Specific ARARs</u> .....	13
8.3.3 <u>Performance, Design, or Other Action-Specific ARARs</u> .....	14
8.3.3.1 <u>Type of ARARs</u> .....	14
8.3.3.2 <u>Well Locating and Sampling</u> .....	14
8.3.3.3 <u>Well Closing</u> .....	14
8.3.3.4 <u>Excavated Material</u> .....	17
<b>9.0 <u>SCHEDULE</u></b> .....	<b>18</b>
<b>10.0 <u>REFERENCES</u></b> .....	<b>19</b>

# REPORT DOCUMENTATION PAGE

Form Approved  
OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.

<b>1. AGENCY USE ONLY</b> (Leave Blank)		<b>2. REPORT DATE</b> 06/00/88	<b>3. REPORT TYPE AND DATES COVERED</b> FINAL	
<b>4. TITLE AND SUBTITLE</b> FINAL DECISION DOCUMENT FOR THE INTERIM RESPONSE ACTION FOR THE CLOSURE OF ABANDONED WELLS AT ROCKY MOUNTAIN ARSENAL			<b>5. FUNDING NUMBERS</b>  NONE	
<b>6. AUTHOR(S)</b>				
<b>7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)</b> EBASCO SERVICES, INC.			<b>8. PERFORMING ORGANIZATION REPORT NUMBER</b>  88329R05	
<b>9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)</b>			<b>10. SPONSORING/MONITORING AGENCY REPORT NUMBER</b>	
<b>11. SUPPLEMENTARY NOTES</b> NONE				
<b>12a. DISTRIBUTION/AVAILABILITY STATEMENT</b>  APPROVED FOR PUBLIC RELEASE; DISTRIBUTION IS UNLIMITED			<b>12b. DISTRIBUTION CODE</b>	
<b>13. ABSTRACT</b> (Maximum 200 words) <p>THE OBJECTIVE OF THE ABANDONED WELL CLOSURE INTERIM RESPONSE ACTION IS TO LOCATE, EXAMINE, AND PROPERLY CLOSE WELLS THAT MAY BE ALLOWING, OR COULD POTENTIALLY ALLOW, MIGRATION OF CONTAMINATION FROM UPPER AQUIFERS TO DEEPER AQUIFERS.</p> <p>THIS FINAL DECISION DOCUMENT PROVIDES SUMMARIES OF:</p> <ol style="list-style-type: none"> <li>1. ALTERNATIVES CONSIDERED</li> <li>2. SIGNIFICANT EVENTS LEADING TO THE AWARD OF THE IRA CONTRACT</li> <li>3. THE IRA PROJECT</li> <li>4. THE APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS, STANDARDS, CRITERIA, OR LIMITATIONS (ARAR'S) ASSOCIATED WITH THE PROGRAM.</li> </ol> <p>COMMENTS AND RESPONSES ARE FOUND IN THE APPENDIX.</p>				
<b>14. SUBJECT TERMS</b> ARARS, TREATMENT, CONSTRUCTION, IRA D			<b>15. NUMBER OF PAGES</b> 26	
			<b>16. PRICE CODE</b>	
<b>17. SECURITY CLASSIFICATION OF REPORT</b> UNCLASSIFIED	<b>18. SECURITY CLASSIFICATION OF THIS PAGE</b>	<b>19. SECURITY CLASSIFICATION OF ABSTRACT</b>	<b>20. LIMITATION OF ABSTRACT</b>	

**FINAL DECISION DOCUMENT  
FOR THE INTERIM RESPONSE ACTION FOR  
THE CLOSURE OF ABANDONED WELLS AT  
ROCKY MOUNTAIN ARSENAL**

**1.0 INTRODUCTION**

The Interim Response Action (IRA) for the Closure of Abandoned Wells at the Rocky Mountain Arsenal (RMA) is being conducted as part of the IRA Process for RMA in accordance with the June 5, 1987 report to the court in United States v. Shell Oil Co. and the proposed Consent Decree. The IRA project will include a search for all pre-1942 wells and for post-1942 wells for which accurate construction information does not exist or exists and indicates that the wells may not have been properly constructed. Wells identified in the ongoing RI/FS project at RMA as having improper construction techniques and a significant potential for allowing inter-aquifer contamination are also included in the IRA. The program itself involves a search for wells on a priority basis, with subsequent closure of the wells. The IRA is presently being conducted under Task 37 of the RI/FS program, but it is anticipated that a follow-up contract will be required to complete closure of all wells judged important enough to require action.

## 2.0 HISTORY OF RMA WELLS

RMA was constructed circa 1942 in an area that had been devoted to agricultural and residential use. As many as 250 water wells for irrigation, stock watering, and domestic use were constructed on what is now RMA property. Information on the pre-1942 wells, available from scattered sources, indicates that about one-half of the wells are greater than 30 inches in diameter and were probably hand-dug. The reported well depths range from 15 to 1,000 feet with approximately 40 wells over 100 feet deep. It is also reported that approximately 40 of the pre-1942 wells have been "filled" and an additional unspecified number have been covered. The remainder of the wells were probably left open (Morrison-Knudsen, 1985, RIC 85343R01). It has been estimated that approximately 200 of these 250 wells are not usable for monitoring purposes (ESE, 1986, RIC 87013R01).

In addition, since the establishment of RMA in 1942, hundreds of monitoring wells have been installed on the property. The majority of these wells are in good condition and still in use. It has been determined, however, that approximately 150 to 200 of the post-1942 monitoring wells are no longer usable (ESE, 1986, RIC 87013R01). Information on most of the post-1942 monitoring wells is available from the USATHAMA database. These wells are reportedly two to six inches in diameter and 15 to 140 feet deep.

### **3.0 INTERIM RESPONSE ACTION OBJECTIVES**

The Program Manager's Office for the Rocky Mountain Arsenal Contamination Cleanup (PMO-RMA) is concerned with the potential for contaminant migration between aquifers through unused and undocumented wells on RMA. The objective of the Abandoned Well Closure IRA is to locate, examine, and properly close wells on RMA that may be allowing, or could potentially allow, migration of contamination from upper aquifers, some of which are known to be contaminated, to deeper aquifers.

This final decision document provides a summary of the alternatives considered, a chronological listing of the significant events leading to the award of the IRA, a summary of the IRA project, and a summary of the Applicable, or Relevant and Appropriate Requirements, standards, criteria, or limitations (ARARs) associated with the program.

#### 4.0 INTERIM RESPONSE ACTION ALTERNATIVES

In a June 5, 1987 report to the court in United States v. Shell Oil Co., the United States (the Army and EPA), Shell and the State of Colorado committed to the need for an Abandoned Wells Closure IRA that was described as follows:

The parties agree that all wells on the Arsenal that are not currently part of the ongoing groundwater monitoring program or that are not suitable for inclusion in the future monitoring program will be plugged and closed by the United States. This action will ensure that such wells do not serve as conduits for the flow of contamination from upper to lower ground water aquifers. The parties will meet on June 9, 1987 to reach consensus on which wells are appropriate for sampling and closure and to develop a priority closure list.

In early February, 1988 the parties lodged a proposed Consent Decree with the court in United States v. Shell Oil Co. that contains a similar provision.

Accordingly, with respect to this IRA, the typical alternatives analysis that is usually performed pursuant to CERCLA has been supplanted by these documents. The following discussion of alternatives is therefore an abbreviated one in recognition of the advanced stage of the project and the fact that the fundamental decisions with respect to the need for and nature of the Abandoned Wells Closure IRA are the product of a consensus reached months ago.

The overall IRA alternatives considered by the U.S. Army for the RMA Abandoned Wells are as follows:

1. No action;
2. Further study of the potential for inter-aquifer contamination;
3. Incorporation of the wells into existing or future monitoring programs; and
4. Closure of the wells in accordance with standardized practices in use by water well contractors and in compliance with the ARARs that pertain to well sealing.

The alternatives assessment for this IRA was relatively straightforward. The no-action alternative was quickly ruled out as unacceptable. There is known contamination in the upper aquifers at RMA. There are some data available to indicate that there is a net upward component to the inter-aquifer flow on some portions of RMA, but there are insufficient data available to guarantee that there is no downward flow component from these upper aquifers to lower, uncontaminated aquifers at other locations on-post. These deeper aquifers represent a valuable resource for the Denver Metropolitan area, and are worthy of protection from RMA-based contamination. The no action alternative would have allowed any inter-aquifer contamination that may be occurring at present to continue, and would have done nothing to stop the potential for future contaminant migration.

Further study of the hydraulic gradients between the various aquifers underlying RMA is an ongoing process, and will be continued whether or not the well closure program is undertaken. In consideration of the time required to complete the hydrologic assessment to ensure, with a high degree of confidence, that the downward flow component is not important in terms of contaminant migration, further study was judged not to be an acceptable alternative for remediating the potential problem.

The use of the wells for existing or future monitoring programs was deemed unacceptable because the construction information on these wells either demonstrated that proper construction techniques were not employed, or that insufficient information exists to determine whether the construction methods would be acceptable. Particularly for water quality, well construction methods play an important role in determining the integrity of the samples collected from the well. Unless the sample integrity can be proven acceptable, use of the well for monitoring is not considered a viable alternative. Similarly, for wells that could potentially be screened across more than one aquifer, even water level measurements would be suspect, and therefore unacceptable. Further use of these wells for monitoring was judged not to be an acceptable alternative for remediating the potential problem.

The final alternative considered was closure of the wells. This alternative was selected because it would ensure complete cessation of any inter-aquifer contamination occurring along or through well casings. In addition, some of the abandoned wells pose physical hazards to workers and other site visitors due to the potential for falls into the open wells. Closure of the wells would eliminate these physical hazards.

Within this overall closure scenario, there were a number of approaches that could be used to evaluate and, ultimately, close individual wells. Much of the evaluation work has already been performed under Tasks 4 and 44, the groundwater screening and monitoring programs. Further evaluations have been conducted under the preliminary stages of Task 37, the Well Abandonment Program. During the development of the Task 4 Technical Plan (ESE, 1986, RIC 87013R01), a data sheet for each well was prepared. This sheet contained information on the construction characteristics of the wells, their locations, date of installation, screened intervals, etc. Based on the information obtained, the 1,568 known wells on RMA were separated into three general categories. Three hundred fifty five wells were judged suitable for ground water sampling and water level measurements. An additional 490 wells were judged to be suitable for water level measurements only. Of the remaining 720 wells, it was determined that 181 were unacceptable for either sampling or water level measurement, 96 were previously closed, and 443 had insufficient data to determine their suitability for further use. Nearly all of the pre-1942 wells were in the category of insufficient data.

The Task 37 Technical Plan describes alternative strategies for field searches, well assessments, possible sampling, and well closure procedures. In summary, first and second level field searches were established. Each well considered in the Task 37 program was screened for inclusion into a first level search based upon well characteristics such as proximity to known contamination plumes, depth, or penetration of two or more aquifers. If the well could not be found in the first level

search using visual observation and conventional geophysics, it was again screened for inclusion into a more elaborate second level search. Procedures for determining whether or not to sample a particular well were also developed, based upon well condition, proximity to existing monitoring wells and edges of contamination plumes, and aquifer penetration. Proposed well closure procedures are also described in the Technical Plan.

## **5.0 CHRONOLOGY OF EVENTS FOR THE ABANDONED WELL IRA**

The significant events leading up to and including the award of the contract for the prioritization, search, sampling (limited), and closure of abandoned wells are presented below.

Oct 3, 1986	PMO-RMA issues Proposed Delivery Order to Ebasco Services Incorporated under Contract Number DAAK11-84-D-0017 to "Review existing information and formulate an adequate methodology through geophysical and other techniques, as appropriate, in order to (a) physically locate, record current condition, and survey exact positions, (b) sample and chemically analyze for contaminants and, (c) plug the wells using proper techniques...to mitigate any downward contaminant flow from one aquifer to another by way of the abandoned wells."
Apr 17, 1987	PMO-RMA issues Order for Services to Ebasco Services Incorporated to carry out the first phase of the well closure program at RMA. The amount of the contract is \$1,246,148. It is awarded as Task Order Number 37.
May 11, 1987	PMO-RMA holds kick-off meeting for Task 37 with Ebasco Services Incorporated and their intended subcontractor for the well closure program, Geraghty & Miller, Inc. Ebasco/Geraghty & Miller is directed to prepare an approach for carrying out the Task and to develop a Management Plan for it.
Jun 9, 1987	PMO-RMA holds a meeting with Shell Oil Company, the State of Colorado, and the EPA, along with their contractors, to discuss the technical approach to be used for the well closure program.
Jul 1, 1987	PMO-RMA submits draft Technical Plan to MOA parties for review and comment.
Jul 29, 1987	Comments received from Shell Oil Company on Task 37 Technical Plan.
Aug 17, 1987	First level field search initiated.
Sep 28, 1987	Comments received from US EPA on Task 37 Technical Plan.
Oct 30, 1987	PMO-RMA directs Ebasco to halt work on Task 37 until Decision Document can be prepared.
Jan 7, 1988	Comments received from the State of Colorado on the Task 37 Technical Plan.
Feb 22, 1988	Comments received from the US Department of the Interior(DOI) on the Task 37 Technical Plan.

## **6.0 SUMMARY OF THE INTERIM RESPONSE ACTION PROJECT**

The IRA for Abandoned Well Closure under Task 37 consists of ten major work components as described below:

1. An historical literature review will be performed to identify information on the location, water quality, and condition of the pre-1942 wells and to identify the post-1942 monitoring wells that are no longer in use or considered unusable for further water quality sampling or water level measurement.
2. The estimated 200 unusable pre-1942 wells and the estimated 150 unusable post-1942 monitoring wells will be prioritized by their potential for adverse impact and the need to locate these wells to institute a first level field search.
3. The first level field search will be conducted to confirm the approximate locations of wells with a high field search priority. The first level search will consist of a site visit with such equipment as a metal detector or magnetometer. If the well is located, it will be labeled and staked for land surveying.
4. Wells that are not found during the first level field search will be prioritized by the need to locate these wells and the applicability of additional location techniques.
5. A second level field search will be initiated for wells with a high second level field search priority. The second level search will employ specialized geophysical search techniques in a final attempt to locate a well. The exact methodology used to locate the well will be chosen based on the applicability of each technique.
6. Once a well is located, it will be examined to establish its physical condition and the need for, or suitability of, properly closing it. The procedures will vary with the condition, type, construction, diameter, and depth of each well.
7. Wells located in the field searches will be evaluated for the need to sample the well before properly closing it. Evaluation criteria will include the location of the well, the aquifer penetrated by the well, and the location and water quality of nearby wells.
8. A water sampling program will be conducted on wells that meet the sampling criteria prior to the closure of the wells. The samples will be analyzed for volatile halogenated organics, organochlorine pesticides, phosphonates, arsenic, mercury, and dibromochloropropane.
9. Wells will be properly closed in the order of their associated first level field search priority. This will ensure that the deeper wells in existing contaminant plumes will be properly closed first. Wells

that are sampled will be closed after sampling. Each well will be examined separately and the closure procedure will be designed to eliminate the vertical movement of water within the annular space and within the well bore, prevent intermingling of water from different aquifers, eliminate physical hazards, and prevent ground-water contamination from surface or near-surface sources.

Closure methods will follow standardized procedures in use by water well contractors and in accordance with USATHAMA Quality Assurance/Quality Control procedures. These methods are in compliance with EPA and State of Colorado standards for well sealing (Colorado State Board of Examiners of Water Well and Pump Installation Contractors, 1984). If proper closure necessitates procedures that differ from those described below, the Organizations and the State will be consulted prior to the actual abandonment.

To properly seal an abandoned water well, the following tasks should be accomplished:

- (a) Elimination of physical hazards;
- (b) Maintenance of hydrostatic head of aquifers;
- (c) Prevention of intermingling of water from different aquifer zones;
- (d) Prevention of ground water contamination from surface or near-surface sources.

Each well to be plugged will be examined as a separate entity and careful consideration will be given to the original design of the well (if this can be determined) and the geologic environment. The plugging operation will be designed to eliminate the vertical movement of water within the annular space and within the well bore. If artesian conditions exist, the sealing operation will be designed in such a way as to confine the water to the aquifer and prevent either loss of artesian pressure or circulation between two distinct aquifers.

To properly plug a well, all materials that may hinder the sealing operation will be removed to the extent possible, including the screen and casing. If the casing cannot be removed it may have to be cut, torn, or perforated to allow the grout to completely fill the annular space as well as the interior of the casing. This will be accomplished through the use of a perforating tool, a casing knife, or explosives.

The grout will be introduced at the bottom of the well, or at the interval to be sealed (or filled) and placed progressively upward to the top of the well. All sealing materials will be placed by the use of grout pipe, tremie pipe, cement bucket, or dump bailer to avoid segregation or dilution of the sealing materials. To ensure a competent

seal between the grout and the borehole, the grout will be pumped until it flows undiluted from the well at ground surface. When conditions permit, the grout placement and casing removal will be conducted at the same time in such a way as to maintain 10 feet of grout within the casing yet to be removed.

Plugging of the wells will proceed after the borehole has been inspected and logged to ascertain casing and hole conditions. Assuming no complications, the cement grout will be placed at the bottom of the hole and the well will be filled to land surface. If the casing appears to be in good condition, an attempt will be made to jack up the casing and remove it while the cement is being placed. If the casing appears to be in poor shape, no attempt will be made to recover it, as this might cause the hole to collapse and prevent a proper cementing job.

The cementing operation for deep wells will be handled in accordance with water well and oil drilling technology. The cementing operation will be planned taking into consideration the borehole diameter, depth, temperature, hole deviation, formation properties, and casing. The cement composition will be determined based upon hole conditions, additives, volume, and setting time desired. Water of drinking water quality will be used for cement mixing. The cement density will be monitored and recorded throughout the cementing operation to assure that the proper mixing ratio is maintained.

The cement will be placed in the well by means of tubing or drill pipe if the diameter of the well is large enough. The cement slurry will then be pumped through the tubing which is withdrawn before the cement sets. Should it be necessary to seal the annular space between the casing and hole wall near the land surface, cement will be injected with small diameter tubing around the casing.

Three major types of wells are expected to be closed, each requiring somewhat different abandonment techniques.

#### (a) Large Diameter Dug Wells

The dug wells with diameters of 48 to 60 inches and depths of 30 to 50 feet are typically constructed with a 4 inch thick concrete liner. The wells will be filled with commercial grade concrete as it is less expensive than neat cement or grout. If care is taken in the placement of the concrete, preventing separation of the aggregate and cement, the concrete plug should provide an excellent permanent seal. Some of the dug wells may have been deepened by drilling, and closure procedures for these wells are discussed below.

#### **(b) Shallow Post-1942 Monitoring Wells**

These wells typically are constructed of PVC or steel and have a diameter of 2 to 6 inches with a range of depths from 15 to 1450 feet. Most of the wells are equipped with short sections of PVC screen set opposite water-bearing sections in the alluvial aquifer or Denver sandstone beds. Some wells are equipped with stainless steel well screens. If the initial checking of the well indicated no complications, an attempt will be made to recover the pipe and screen. In most cases it is expected that the records and field inspection will show that the well casing was cemented in place and that no pulling or salvaging of casing and screen is possible. In that case the screen portion of the well will be backfilled with clean (in accordance with State of Colorado regulations) and the remainder of the borehole will be filled with grout to the land surface.

#### **(c) Pre-1942 Farm Wells**

Little is known about the construction of the farm wells that existed at RMA at the time the government acquired the property. It is believed that the drilled farm wells range in diameter from 3 to 18 inches and that their depths range from 15 to 1,000 feet. Some 40 wells are believed to be deeper than 100 feet. The shallow wells probably tapped alluvial or Upper Denver sandstone beds. The deeper wells probably tapped the Arapahoe Formation. To properly close these wells, an attempt will be made to remove the casings prior to grouting the borehole. The techniques used to accomplish this will vary depending upon casing type and well construction, but will include drilling or washing out debris found in the well, pulling the casing, and overdrilling the casing. If the casing cannot be removed, it will be perforated. After pulling or perforating the casing, the borehole will be filled with grout. The grout will be pumped into the borehole using a tremie pipe.

For wells that have contradictory or incomplete well construction records, information on the original total depth and design of each well will be developed from drilling records acquired during the redrilling/cleaning of the wells and from limited use of borehole geophysical techniques; subsequently, the well will be closed according to the procedures outlined above.

10. Each well located will be surveyed to establish its elevation and map coordinates with respect to an established grid, which is consistent with USATHAMA requirements.

## **7.0 IRA PROCESS**

With respect to the Abandoned Wells IRA, the IRA Process is as follows:

1. The Army afforded the Organizations, DOI and the State an opportunity to participate, at the equivalent of the RMA Committee level (it was equivalent because the RMA Committee did not exist as such at the time), in the identification and selection of ARARs pertinent to this IRA. In this instance, the participation took the form of the June 9, 1987 meeting with EPA, Shell and the State, the July 1, 1987 submission of the Technical Plan (which here served as the functional equivalent of the IRA assessment) to EPA, Shell and the State for review and comment, and through the Army's receipt of comments from EPA, Shell and the State on the Task 37 Technical Plan. By agreement, the plugging and closure of the abandoned wells is to be performed in accordance with the criteria developed in July 1987 by the Army, EPA, Shell and the State.
2. EPA, Shell, and the State were afforded an opportunity to identify, on a preliminary basis, any potential ARARs.
3. The Army issued this proposed Abandoned Wells Closure IRA Decision Document for a 30-day public comment period. This proposed Decision Document is also supported by an administrative record.
4. Promptly after the close of the comment period on the proposed Decision Document, the Army shall transmit to the other Organizations, DOI and the State a draft final IRA Decision Document.
5. Within 15 days of issuance of the draft final Abandoned Wells Closure IRA Decision Document, an Organization (or DOI where appropriate) may invoke Dispute Resolution.
6. After the close of the period for invoking Dispute Resolution (if Dispute Resolution is not invoked) or after the completion of Dispute Resolution (if invoked), the Army shall issue a final Abandoned Wells Closure IRA Decision Document to the other Organizations, DOI and the State and shall notify the public of the availability of the final IRA with the supporting record. Only preliminary design work for the IRA may be conducted prior to the issuance of the final IRA Decision Document.
7. Thereafter, the Abandoned Wells Closure IRA Decision Document will be subject to judicial review in accordance with Section 113 and 121 of the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended (CERCLA), 42 U.S.C. §§ 9613 and 9621.

## 8.0 ARARs

### 8.1 ATTAINMENT OF ARARs

The interim action process reported to the Court on June 5, 1987, in United States v. Shell Oil Co. provides that the IRAs (including the Abandoned Wells Closure IRA), shall, to the maximum extent practicable, attain ARARs. A similar provision appears in Paragraph 9.7 of the proposed Consent Decree.

### 8.2 IDENTIFICATION AND SELECTION OF ARARs

By letter dated October 27, 1987, counsel for the Army requested that EPA, Shell, and the State preliminarily identify in writing the potential ARARs that they believe may be pertinent to the Abandoned Wells Closure IRA. EPA and Shell responded to the letter without identifying any potential ARARs.

### 8.3 SELECTION OF ARARs AND DETERMINATION OF ARAR IMPACT

#### 8.3.1 Ambient or Chemical-Specific ARARs

Ambient or chemical-specific requirements set health or risk-based concentration limits or ranges in various environmental media for specific hazardous substances, pollutants, or contaminants. Such ARARs set either protective cleanup levels for the chemicals of concern in the designated media or indicate an appropriate level of discharge.

For purposes of the Abandoned Wells Closure IRA, there are no pertinent ambient or chemical-specific ARARs.

#### 8.3.2 Location-Specific ARARs

Location requirements set restrictions on activities depending on the characteristics of the site or the immediate environment. These requirements function like action-specific requirements. Alternative remedial actions may be restricted or precluded depending on the location or characteristics of the site and the requirements that apply to it.

For purposes of the Abandoned Wells Closure IRA, there are no pertinent location-specific ARARs.

It should be noted that Paragraphs 23.2 (e) and (f) of the proposed Consent Decree provide that:

- (e) Wildlife habitat(s) shall be preserved and managed as necessary to protect endangered species of wildlife to the extent required by the Endangered Species Act, 16 U.S.C. §§ 1531 *et seq.*, migratory birds to the extent required by the Bald Eagle Protection Act, 16 U.S.C. §§ 668 *et seq.*

- (f) Other than as may be necessary in connection with a Response Action or as necessary to construct or operate a Response Action Structure, there shall be no change permitted in the geophysical characteristics of RMA that has a significant effect on the natural drainage at RMA for floodplain management, recharge of groundwater, operation and maintenance of Response Action Structures, and protection of wildlife habitat(s).

While these provisions are not ARARs, they obviously must be complied with for purposes of this IRA. Based on communications with the U.S. Fish and Wildlife Service, it appears that the Abandoned Wells Closure IRA, as presently described in the Technical Plan and the Proposed Decision Document, will have no adverse impact on any endangered species, migratory birds, or the protection of wildlife habitats because it will accommodate all of the concerns of the U.S. Fish and Wildlife Service.

Moreover, the Army has separately determined that this IRA will not change the physical characteristics of RMA in a manner that will have significant effect on the natural drainage at RMA for floodplain management, recharge of groundwater, and operation and maintenance of Response Action Structure.

### 8.3.3 Performance, Design, or Other Action-Specific ARARs

#### 8.3.3.1 Type of ARARs

Performance, design, or other action-specific requirements set controls or restrictions on particular kinds of activities related to the management of hazardous substances, pollutants or contaminants. These action-specific requirements may specify particular performance levels, actions or technologies, as well as specific levels (or a methodology for setting specific levels) for discharged or residual chemicals.

#### 8.3.3.2 Well Locating and Sampling

With respect to the agreed upon procedures for locating abandoned wells through the first and second level field search, and evaluation of such wells to determine the need for sampling before closing them and sampling, there are no pertinent action-specific ARARs.

#### 8.3.3.3 Well Closing

The Army has identified the following regulations as relevant and appropriate to the closing of the identified abandoned wells:

- (i) 40 C.F.R. § 144.12 (a) – Underground Injection Control (UIC) prohibition of movement of fluid into underground sources of drinking water;
- (ii) 40 C.F.R. § 144.28 (c) (2) – UIC plugging and abandonment plan for EPA administered program; and

(iii) 40 C.F.R. § 146.10 – UIC plugging and abandoning Class I-III wells.

None of the abandoned wells that are the subject of this IRA is properly classified as an UIC injection well within the meaning of 40 C.F.R. § 144.6. The four classes of wells are: (a) Class I – wells used to inject hazardous waste beneath the lower most formation that contains, within one-quarter mile of the well bore, an underground source of drinking water; (b) Class II – wells which inject fluids in connection with conventional or enhanced recovery of oil or natural gas, and wells which inject fluids that are hydrocarbons and are liquid at standard temperature and pressure; (c) Class III – wells that inject for the extraction of minerals, including mining of sulfur, *in situ* production of uranium, or solution mining of salts and potash; (d) Class IV – wells used to inject hazardous or radioactive waste into a formation within or above one-quarter mile of a drinking water system or to dispose of unclassified hazardous waste. The jurisdictional prerequisites of these requirements are not met. Thus, the foregoing regulations are not applicable here.

Nevertheless, these regulations do address problems or situations sufficiently similar to those encountered at the RMA CERCLA site that use of these regulations is well-suited to this site and accordingly they will be treated as “relevant and appropriate.” A requirement that is relevant and appropriate must be complied with to the same degree as if applicable. However, there is more discretion in this determination: it is possible for only part of a requirement to be considered relevant and appropriate, the last being dismissed if judged not to be relevant and appropriate in a given case.

Accordingly, the following performance, design or other action-specific ARARs are selected by the Army as relevant and appropriate to this portion of the IRA:

- (i) 40 C.F.R. § 144.12 (a) – Provides in pertinent part that a well shall not be abandoned in a manner that allows movement of fluid containing any contaminant into an underground source of drinking water if this causes a violation of a primary drinking water regulation under 40 C.F.R. Part 142 or otherwise may adversely affect the health of persons;
- (ii) 40 C.F.R. § 144.28 (c) (2) – Provides for submission of a plugging and closure plan that includes the following formation:
  - (a) The nature, quantity and material to be used in plugging;
  - (b) The location and extent (by depth) of the plugs;
  - (c) Any proposed test or measurement to be made;
  - (d) The amount, size, and location (by depth) of casing to be left in the well;

- (e) The method and location where casing is to be parted; and
- (f) The estimated cost of plugging the well.

The well is to be plugged and closed in accordance with the plan except with notice to and approval by the EPA Regional Administrator.

(iii) 40 C.F.R. § 146.10 (a)-(c)–

- (a) Prior to closing Class I to III wells the well shall be plugged in a manner which will not allow the movement of fluids either into or between underground sources of drinking water. The Director may allow Class III wells to use other plugging materials if he is satisfied that such materials will prevent movement of fluids into or between underground sources of drinking water;
- (b) Placement of the cement plugs shall be accomplished by one of the following:
  - (1) The Balance method;
  - (2) The Dump Bailer method;
  - (3) The Two-Plug method; or
  - (4) An alternative method approved by the Director, which will reliably provide a comparable level of protection to underground sources of drinking water.
- (c) The well to be closed shall be in a state of static equilibrium with the mud weight equalized top to bottom, either by circulating the mud in the well at least once or by a comparable method prescribed by the Director, prior to the placement of the cement plug(s).

In conformance with these relevant and appropriate ARARs, the Army will not close the wells in a manner that allows the movement of fluid containing contaminants into any underground source of drinking water (40 C.F.R. § 144.12 (a)), a plugging and closure plan will be prepared and provided to EPA, Shell and the State (40 C.F.R. § 144.28 (c) (2)), and the plugging and closure will be done consistent with the provisions of 40 C.F.R. § 146.10 (a)-(c).

Colorado also nominated Section 5 (Abandonment Regulations) of the Revised and

Amended Rules and Regulations for Water Well and Pump Installation Contractors for consideration as ARARs. Section 5 provides in pertinent part that:

- (a) Small diameter wells formerly producing from unconfined material shall be closed by filling with sand or gravel to the static water level, then with inert materials to within 10 feet of the surface. The top 10 feet shall be filled with concrete, neat cement, or other approved material.
- (b) Large diameter wells formerly producing from unconfined material shall be closed by filling with sand or gravel to the top of the water level with inert material to the surface and by installing a permanent water-tight cover of adequate strength at the top of the casing. On farm lands the top 5 feet of casing shall be removed, the hole filled with sand or gravel to the top of the water level with inert materials to within 5 feet of the surface, and shall be capped with concrete or steel 5 feet below the surface.
- (c) Wells formerly completed in confined and unconfined formations or in confined formations only shall be closed by plugging with concrete, neat cement, or other approved material at the first impervious strata above each zone and cement grouted from the surface to a depth of 10 feet. No plug shall be less than 5 feet in length.

Since these provisions are not more stringent than those in 40 C.F.R. § 146.10, they do not warrant treatment as ARARs in this context.

Colorado's other suggestion that a State of Colorado - Well Abandonment Affidavit should be filed with the Colorado Division of Water Resources is plainly not an ARAR. Moreover, it will be sufficient for the Army to file a copy of the plugging and closure plan that will be developed in accordance with 40 C.F.R. § 144.28 (c) (2) to ensure that an adequate record of these actions will be readily available to state residents.

#### 8.3.3.4 Excavated Material

Excavated material will be screened in accordance with the memorandum of June 12, 1985 from EPA Region VIII. Material determined to be potentially contaminated will be managed under the provisions of that memorandum. If material is determined to be hazardous waste, it will be further managed pursuant to substantive RCRA requirements. For materials determined to be hazardous wastes, substantive RCRA provisions are applicable to their management. These substantive provisions include, but are not limited to: 40 C.F.R. Part 262 (Subpart C, Pre-Transport Requirements), 40 C.F.R. Part 263 (Transporter Standards), 40 C.F.R. Part 264 (Subpart I, Container Storage and Subpart L, Waste Piles). The specific substantive standards applied will be determined by the factual circumstances of the accumulation, storage, or disposal techniques actually applied to any such material.

## **9.0 SCHEDULE**

The following milestones for the Abandoned Wells Closure Interim Response Action are based on the assumption that no more than 400 wells will be involved in the second phase of the Abandoned Wells Closure program. In addition, it is also assumed that very few of the wells not found during phase one (i.e., Task 37) will be included in the second phase. In most cases, wells were painstakingly searched for until found or until all historical and physical clues were exhausted. Unless additional information can be found, more searching for these wells will be futile. If the above assumptions prove to be incorrect or if adverse weather or field conditions hamper operations, then the milestones listed below may not be attainable.

- |              |   |
|--------------|---|
| May 6, 1988  | All well searches under Task 37 will be completed. Well closures will begin (assuming no Dispute Resolution is sought).   |
| Sep 27, 1988 | All phase one (Task 37) well closures to be completed and the draft final Task 37 report distributed. Award of a new Task Order Contract for future RMA cleanup. Task 3 of this new contract will be the second phase of the Abandoned Wells Closure IRA program. |
| Dec 2, 1988  | Provide a status update and enhanced schedule based on discussions with the contractor.   |
| Mar 3, 1989  | Field searches and surveys for the post-1942 wells started along with any pre-1942 wells included in the second phase.  |
| May 1, 1989  | Initiate closure of all second phase wells.   |
| Nov 3, 1989  | Draft Final Abandoned Wells Closure IRA report.   |
| Feb 23, 1990 | Final Abandoned Wells Closure IRA report, including comments and responses, distributed.  |

## **10.0 REFERENCES**

**RIC 86317R01**

**Environmental Science and Engineering, Inc., 1986, October. Rocky Mountain Arsenal Water Quantity/Quality Survey, Initial Screening Program, Final Draft Report. USATHAMA Contract Number DAAK11-84-D-0016, Task Number 4, ESE, HLA, Resource Consultants.**

**RIC 85343R01**

**Morrison-Knudsen Engineers, Inc., 1985, August. Report on Pre-1942 Wells at Rocky Mountain Arsenal. Holme, Roberts, and Owen, Denver.**

**RIC 87277R03**

**Ebasco Services, Incorporated, 1987, May. Abandoned Well Program, Draft Final Technical Plan. USATHAMA Contract Number DAAK11-84-D-0017, Task Number 37, Ebasco Services Incorporated, Geraghty & Miller, Incorporated.**

**APPENDIX**  
**COMMENTS AND RESPONSES**



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION VIII

999 18th STREET—SUITE 500  
DENVER, COLORADO 80202-2405

APR 28 1988

Ref: 8RC

BY EXPRESS MAIL

Colonel Wallace N. Quintrell  
Program Manager  
AMYRM-EE  
Department of the Army  
U.S. Army Toxic and Hazardous  
Material Agency  
Building 4468  
Aberdeen Proving Ground, Maryland 21010-5401

Re: Decision Document for the  
Abandoned Well Interim  
Response Action

Dear Colonel Quintrell:

The following constitute U.S. EPA Region VIII's comments concerning the proposed Decision Document for the Interim Response Action ("IRA") for the closure of abandoned wells at Rocky Mountain Arsenal ("RMA") dated March 1988 and received by EPA Region VIII on March 29, 1988.

EPA Region VIII has concern regarding the ARAR analysis portion of the Decision Document. Of primary concern is the lack of discussion and assessment of ARAR's which may be applicable or relevant and appropriate in the event that contaminated materials are removed from the wells to be closed. Specifically, as referenced at page 10 of the Decision Document, pipe screen, casing, and other materials may be removed from wells prior to closure. Nevertheless, there is little discussion with regard to the handling, treatment, transportation, or disposal of this possibly contaminated material. Therefore, we would request that the Decision Document specifically address this potential problem and especially the various ARAR's which would be pertinent to such problems. At the very least, we would anticipate that Federal ARAR's set forth at 40 C.F.R. Part 241, 40 C.F.R. Part 257, and 40 C.F.R. Parts 261-264 warrant consideration in this context.

Please note that the issue of proper management of materials removed from the wells is not new. It was addressed in our letters of November 16, 1987 (attached) and September 28, 1987. While we have endorsed use of the procedure utilized in our July 19, 1985, letter (attached), that procedure involved compliance with pertinent RCRA standards and, thus, it is appropriate to

880783

specifically address those ARAR's in the subject Decision Document.

Also relevant to ARAR analysis as contained in the Decision Document, EPA disagrees with certain statements contained at page 17 of the Decision Document. In the context of evaluating underground injection control ("UIC") regulations to determine their applicability or relevance and appropriateness, the Decision Document states:

"Moreover, since this IRA is being conducted pursuant to CERCLA entirely on-site and in compliance with CERCLA sections 120 and 121, 42 U.S.C. §§ 9620 and 9621, the regulatory jurisdiction associated with the UIC program for the above-referenced regulations simply does not arise. In these circumstances, the nature of the remedial action is such that the jurisdictional prerequisites of these requirements are not met. Thus, the foregoing regulations are not applicable here."

EPA does not disagree that because of the type of wells subject to this IRA, the UIC ARAR's discussed in the above context are not truly "applicable." EPA further agrees with the Army's evaluation that, in any event, these ARAR's are relevant and appropriate. However, as reflected in the above portion from page 17 of the Decision Document, the assertion that because a response action is being conducted entirely on-site, compliance with CERCLA sections 120 and 121 automatically means that all ARAR's are no longer "applicable" is patently wrong.

"Applicable requirements" means those cleanup standards of control or other substantive environmental protection requirements, criteria, or limitations promulgated under Federal or State law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstances at a CERCLA site. "Applicability" implies that the remedial action or the circumstances at the site satisfy all of the jurisdictional prerequisites for a requirement. In essence, then, an ARAR may be "applicable" if all jurisdictional prerequisites for a requirement are met, except that such activity is being taken at a Superfund site. Thus, even when actions are being conducted entirely on site and in compliance with CERCLA sections 120 and 121, ARAR's may still be "applicable." Therefore, EPA requests revision of the IRA Decision Document to reflect this proper interpretation of applicability.

Lastly, in the context of ARAR analysis, the Decision Document at page 19 states that "Colorado's other suggestions that a State of Colorado well abandonment affidavit should be filed with the Colorado Division of Water Resources is plainly not an ARAR." EPA would request further explanation and

clarification for the dismissal of this suggested ARAR. As a general matter, EPA notes that, in determining the extent to which on-site CERCLA response actions should comply with other environmental or public health laws, the Army should distinguish between substantive requirements, which may be applicable or relevant and appropriate, and administrative requirements, which are not. Substantive requirements are those requirements that pertain directly to actions or conditions in the environment. Examples of substantive requirements include quantitative health- or risk-based restrictions upon exposures or types of hazardous substances, technology-based requirements for actions taken upon hazardous substances, and restrictions upon activities in certain special locations. On the other hand, administrative requirements are those mechanisms that facilitate the implementation of the substantive requirements of a statute or regulation. In general, administrative requirements prescribe methods and procedures by which substantive requirements are made effective for purposes of a particular environmental or public health program.

EPA notes at page 20 that, in the context of discussing the schedule and milestones for the abandoned well closure IRA, the Decision Document states that, "If the above assumptions prove to be incorrect or if adverse weather or field conditions hamper operations, then milestones listed below may not be attainable." EPA notes that only under certain pre-specified and designated conditions are milestones and schedules concerning IRA's to be altered and less than fully enforceable. Therefore, while adverse weather or field conditions or other assumptions may create difficulty in meeting schedules as set forth at page 20, only under previously designated conditions may these schedules be extended or modified.

We request correction of the statement on page 15, section 8.2, that "EPA did not respond." Our response letter was dated November 16, 1987; a copy is attached herewith.

Lastly, EPA recognizes that the Task 37 Report is an integral part of this IRA and will have impacts upon actual implementation of this IRA. Therefore, EPA also has attached to this letter certain comments and questions pertinent to integration of Task 37 and the Decision Document and which we believe warrant consideration during implementation of the abandoned well IRA.

Sincerely,



Robert L. Duprey, Director  
Hazardous Waste Management  
Division

cc: Thomas P. Looby, CDH  
David Shelton, CDH  
Lt. Col. Scott P. Isaacson  
Chris Hahn, Shell Oil Company  
R. D. Lundahl, Shell Oil Company  
Thomas Bick, Department of Justice  
David Anderson, Department of Justice  
Preston Chairor, EBASCO

## REVIEW COMMENTS

**SUBJECT DOCUMENT:** Proposed Decision Document for the Interim Response Action for the Closure of Abandoned Wells at Rocky Mountain Arsenal  
March 1988

Since only preliminary design work for an Interim Response Action (IRA) may be conducted prior to the issuance of the final IRA decision document, the level of detail presented in the proposed decision document is understandably brief. However, since the Army would like to initiate the program on an experimental basis as soon as possible, EPA is providing comments on more detailed design issues. Similar comments were made on the Task 37 draft final Technical Plan. These comments should be considered while implementing the limited experimental program and in developing the final decision document.

1. Section 6, Item 2, page 9. An additional sub-category in the well prioritization should be whether a well is located in an area where plume definition is uncertain (for example, at the margins of the plume, or in areas where flow directions and concentrations are not clearly defined). If a well is located in an area where plume definition is uncertain, it should be assigned a higher priority for abandonment. Another sub-category might also be the location of a well with respect to specific sources. Finally, as Shell noted in their comments on the Task 37 Technical Plan, prioritization should be based on any contaminant plumes located in any overlying aquifer penetrated by a particular well.
2. Section 6, Item 6, page 9. The Task 37 Technical Plan indicated that if a well is found filled with cement, it will be assumed to already be properly abandoned. This is not necessarily true, especially for the older wells for which no records are available. It is possible that the well was backfilled with dirt and only cemented near the surface. It is also possible that the cement in the casing or the annulus has gaps. In cases where a well is found already cemented, it should be re-drilled in order to ascertain its design and condition, following which the well should be properly abandoned. Where it is not possible to clear blocked wells, what other action will be taken?
3. Section 6, Item 8, page 9. It is planned that some wells will be sampled for chemical analyses. Some of the older wells will have no construction information and may be open to several geologic formations. If such a well is sampled using standard evacuation procedures, a high probability exists for inducing movement of ground water along the annulus of the casing or through breaks in the casing. Therefore the sampling and analysis results may not be representative of only the lower aquifer. As a result, sampling and analysis of certain wells will not be a definitive method for estimating whether contamination has moved to the lower aquifer via the well. The only definitive way to determine formation contamination is either to isolate the aquifer of concern (for example, with packers) in order to

obtain a representative sample or to install a new well. Based on these limitations, sampling of re-entered wells should only be done on a limited basis where construction information suggests that a representative sample can be obtained. If it is planned to isolate certain formations, procedures for doing so should be described.

4. Section 6, Item 9, pages 10-11. It may be necessary to pressure grout certain sections of borings in certain situations to assure an adequate seal in deeper wells. The fate of casing material and debris removed from these wells should be addressed in the plan.
5. Section 6, Item 9, page 12. Very little information is available on the older (and deeper) wells. The general abandonment procedure calls for locating wells and sounding them to confirm their total depth. It is possible that in the case of an old well with no design record, a collapsed casing or other obstruction might be mistaken for the well bottom. Two aquifer zones beneath the obstruction could still be in hydraulic connection via the borehole even after the top of the well was grouted. EPA just wants to emphasize that the well may need to be re-drilled in order to ascertain its design following which it should be properly abandoned.

**RESPONSES TO US EPA ON PROPOSED DECISION DOCUMENT  
FOR THE INTERIM RESPONSE ACTION FOR  
THE CLOSURE OF ABANDONED WELLS AT  
ROCKY MOUNTAIN ARSENAL**

**Response to General Comments -**

1. EPA is concerned with the handling, treatment, transportation, or disposal of material removed from abandoned wells.

Response: The material removed from abandoned wells will be screened to determine whether it is potentially contaminated in accordance with the procedure identified by EPA in the memorandum of June 12, 1985. If the screening procedures determine that material is potentially contaminated, that material will be drummed and processed in accordance with that memorandum, e.g., that storage and further management of material determined to be hazardous waste will be in accordance with substantive RCRA requirements. Substantive RCRA requirements which could be ARARs for the management of materials determined to be hazardous waste may be found in 40 C.F.R. Part 241, 40 C.F.R. Part 257, and 40 C.F.R. Parts 261-264. The Army believes that there is a low probability that material will be excavated which will be determined to be hazardous and that the June 12, 1985 memorandum provides adequate direction. A more detailed discussion of potential ARARs is now contained in the Decision Document.

2. Because a response action is being conducted entirely on site, and in compliance with CERCLA Sections 120 and 121, does not mean that the underground injection control regulations are not applicable to this IRA.

Response: The UIC program is intended to set standards for UIC wells. Since these wells are not underground injection wells, the UIC provisions are not applicable. The fact that the response action is conducted on site does not, by itself, mean that these regulations are not applicable. The language on page 15 was deleted.

3. Further discussion is requested concerning why the filing of a Colorado well abandonment affidavit is not an ARAR.

Response: The filing of a Colorado well abandonment affidavit is not an ARAR because the affidavit does not establish a standard of control for any hazardous substance, pollutant, or contaminant. Substantive standards for well closure are established by Section 5 of the Colorado Rules and Regulations for Water Well and Pump Installation Contractors, which are discussed in the Decision Document.

4. While adverse weather or field conditions or other assumptions may create difficulty in meeting schedules, only under previously designated conditions may these schedules be extended or modified.

Response: The Decision Document was only intended to note that the schedule published on page 20 could be subject to change. Schedules, and extensions thereof, are discussed in detail in Section XVIII of the RI/FS Process Document and it was considered unnecessary to reiterate that discussion in the Decision Document.

### **Response to Specific Comments -**

General: Since only preliminary design work for an Interim Response Action (IRA) may be conducted prior to the issuance of the final IRA decision document, the level of detail presented in the proposed decision document is understandably brief. However, since the Army would like to initiate the program on an experimental basis as soon as possible, EPA is providing comments on more detailed design issues. Similar comments were made on the Task 37 draft final Technical Plan. These comments should be considered while implementing the limited experimental program and in developing the final decision document.

Response: The Decision Document process is intended as a legal vehicle for the planning and implementation of interim response actions on RMA prior to the final Record of Decision. As such, the decision document usually contains a summarized version of the technical assessment for that interim action. This summarized version of the technical assessment is not to be interpreted as a replacement for or a change to the technical assessment. In cases where a specific technical point or criteria has been left out of the summarized version, please refer to the appropriate technical plan, report, or assessment document.

1. Section 6, Item 2, page 9. An additional subcategory in the well prioritization should be whether a well is located in an area where plume definition is uncertain (for example, at the margins of the plume, or in areas where flow directions and concentrations are not clearly defined). If a well is located in an area where plume definition is uncertain, it should be assigned a higher priority for abandonment. Another sub-category might also be the location of a well with respect to specific sources. Finally, as Shell noted in their comments on the Task 37 Technical Plan, prioritization should be based on any contaminant plumes located in any overlying aquifer penetrated by a particular well.

Response: The Task 4/44 Initial Screening Report generated contaminant plume maps for each of the compounds listed in Table 37-1 of the Technical Plan,

with the exception of arsenic, mercury, and dibromochloropropane. If a well is inside or less than 1,500 feet from the edge of any plume, it will be given a high priority.

The primary objective of Task 37 is to eliminate the possibility of cross-contamination of aquifers by wells that have not been closed properly. The field search prioritization criteria give high priority to all wells in or near contaminant plumes, since each of these wells presents the possibility of cross-contamination. The uncertainty associated with contaminant plume delineation is taken into account by including any well within 1,500 feet of the edge of any unmapped contaminant plume in the high priority category. This approach also ensures that all contaminant source areas are included in the high priority category.

2. Section 6, Item 6, page 9. The Task 37 Technical Plan indicated that if a well is found filled with cement, it will be assumed to already be properly abandoned. This is not necessarily true, especially for the older wells for which no records are available. It is possible that the well was backfilled with dirt and only cemented near the surface. It is also possible that the cement in the casing or annulus has gaps. In cases where a well is found already cemented, it should be redrilled in order to ascertain its design and condition, following which the well should be properly abandoned. Where it is not possible to clear blocked wells, what other action will be taken?

Response: If a well is found filled with cement or grout a historical record search will be conducted in an attempt to document the plugging operation. If no records are found, it will be necessary to redrill and regROUT the well in order to ensure proper abandonment. In response to this comment in the Task 37 Technical Plan, page 29 and Figure 37-9 of that plan were modified.

3. Section 6, Item 8, page 9. It is planned that some wells will be sampled for chemical analyses. Some of the older wells will have no construction information and may be open to several geologic formations. If such a well is sampled using standard evacuation procedures, a high probability exists for inducing movement of ground water along the annulus of the casing or through breaks in the casing. Therefore, the sampling and analysis results may not be representative of only the lower aquifer. As a result, sampling and analysis of certain wells will not be a definitive method for estimating whether contamination has moved to the lower aquifer via the well. The only definitive way to determine formation contamination is either to isolate the aquifer of concern (for example, with packers) in order to obtain a representative sample or to install a new well. Based on these limitations, sampling of reentered wells should only be done on a limited basis where construction information suggests that a representative sample can be obtained. If it is planned to isolate certain formations, procedures for doing so should be described.

Response: For many of the pre-1942 wells, construction records do not exist. If these

wells are sampled not only will the analytical data be of questionable quality, but the sampling procedure itself may induce movement of ground water between formations. For these reasons PMO has never endorsed the inclusion of well sampling as part of Task 37. However, in deference to other members of the Organizations and the State (OAS), water samples will be obtained from wells that meet the sampling criteria defined in section 1.3.7 of the Task 37 Technical Plan. The OAS will be given sufficient notice of sampling events to participate (collect splits, observe, etc.) if desired. Where it is not possible to clear blocked wells, they will be closed by overdrilling or pulling the casing to the extent possible and subsequently grouting the holes. The text on page 15 and 17, Sections 1.3.6 and 1.3.7, and Figure 37-7 of the Task 37 Technical Plan were modified to clarify these points.

4. Section 6, Item 9, pages 10-11. It may be necessary to pressure grout certain sections of borings in certain situations to assure an adequate seal in deeper wells. The fate of casing material and debris removed from these wells should be addressed in the plan.

Response: In accordance with an agreement reached by the OAS at the Task 37 meeting held on June 9, 1987, any objects removed from the wells such as casing, well screens, pumps, etc. will be decontaminated by steam cleaning and stored on RMA property. The disposal of this material is not covered under Task 32.

5. Section 6, Item 9, page 12. Very little information is available on the older (and deeper) wells. The general abandonment procedure calls for locating wells and sounding them to confirm their total depth. It is possible that in the case of an old well with no design record, a collapsed casing or other obstruction might be mistaken for the well bottom. Two aquifer zones beneath the obstruction could still be in hydraulic connection via the borehole even after the top of the well was grouted. EPA just wants to emphasize that the well may need to be redrilled in order to ascertain its design following which it should be properly abandoned.

Response: The text of the final Task 37 Technical Plan addresses the need to possibly redrill older wells with collapsed casing or other obstructions. The Army realizes that older wells with questionable or no design records may require redrilling to confirm total depth.

# STATE OF COLORADO

## COLORADO DEPARTMENT OF HEALTH

4210 East 11th Avenue  
Denver, Colorado 80220  
Phone (303) 320-8333



Roy Romer  
Governor

Thomas M. Vernon, M.D.  
Executive Director

May 3, 1988

Mr. Donald Campbell  
Department of the Army  
Program Manager's Office  
RMA Contamination Cleanup  
AMXRM-EE, Building E4585  
Aberdeen Proving Ground, MD 21010-5401

Re: State Comments on Proposed Decision Document for the Interim  
Response Action for the Closure of Abandoned Wells at Rocky  
Mountain Arsenal, March, 1988

Dear Mr. Campbell:

Enclosed are the State's comments on the above-referenced  
Proposed Decision Document. In the interest of protecting public  
health and the environment, the State does not object to the  
early commencement of this Interim Response Action provided that  
all State concerns are adequately addressed in the final Decision  
Document.

If there are any questions on the attached documents, please  
contact Mr. Jeff Edson with this division.

Sincerely yours,

David C. Shelton  
Director, Hazardous Materials  
and Waste Management Division

DCS/PB/rw

pc: Michael R. Hope, Deputy Attorney General  
Bruce Huenefeld, PMO (by hand)  
David L. Anderson, Esq.  
Chris Hahn, Shell Oil Co.  
Edward J. McGrath, Esq., HRO  
Michael Gaydosh, Esq., EPA  
Connally Mears, EPA

BW\PBDSHELT.LTR

**COMMENTS ON THE PROPOSED DECISION DOCUMENT FOR THE CLOSURE OF  
ABANDONED WELLS AT ROCKY MOUNTAIN ARSENAL  
MARCH 1988**

General Comment

The State has previously informed the Army that it supports all efforts to implement interim actions which will result in the expeditious cleanup of the Arsenal. Therefore, the State agrees that the closure of abandoned wells should commence as soon as possible. While the State supports this effort, the State previously identified concerns which have not been adequately addressed. The State's major concerns are addressed below.

Specific Comments

1. The State understands that assessing the integrity of the abandonment of the deep disposal well is not an objective of Task 37. However, merely stating that the "deep disposal was properly sealed in 1985" does not address the State's concern. Please provide a copy of the Harrison Western Corporation, 1985 report cited at page 75 of the final Technical Plan to the State for review to determine whether an assessment of the integrity of the deep disposal well closure is necessary under a different task.

2. While the State agreed to limit the Task 37 study area to the areas described in response to the State's specific comment number 1, this agreement was limited to the Task 37 contract award. The areas currently excluded from the Task 37 study area must be included as part of this Interim Action when the new contract is awarded.

3. ARARs. All subsections of Section 5, "Abandonment Regulations," including subsection (1), of the Revised and Amended Rules and Regulations for Water Well and Pump Installation Contractors must be included as an applicable regulation. The State regulations are more stringent than the federal regulations because State regulations are intended to protect all aquifers, unlike the federal regulations which only protect underground sources of drinking water.

4. The State disagrees that the filing of a generic plugging and closure plan is sufficient documentation for well closures. The Army has already recognized that under some circumstances proper closure of a well may necessitate procedures which differ from those contained in this document and the Task 37 Technical Plan. The Army must supply the State with a well-by-well summary of how each well was properly closed.

5. Information on all wells which have been located to date and all other historical and/or pertinent information must be made available to the parties and State. The State requests that this information be made available at the earliest possible date. The State reserves the right to request a field search and/or sampling of specific wells after it has had the opportunity to review the above-mentioned information.

BW\BPDDCMT.RMA

**RESPONSES TO COLORADO DEPARTMENT OF HEALTH  
REVIEW COMMENTS OF PROPOSED DECISION DOCUMENT  
FOR THE INTERIM RESPONSE ACTION FOR  
THE CLOSURE OF ABANDONED WELLS AT  
ROCKY MOUNTAIN ARSENAL**

**Response to General Comments -**

No response required

**Response to Specific Comments -**

1. The State understands that assessing the integrity of the abandonment of the deep disposal well is not an objective of Task 37. However, merely stating that the "deep disposal was properly sealed in 1985" does not address the State's concern. Please provide a copy of the Harrison Western Corporation, 1985 report cited at page 75 of the final Technical Plan to the State for review to determine whether an assessment of the integrity of the deep disposal well closure is necessary under a different task.

Response: The State's request for a copy of the Harrison Western Corporation Report concerning the closure of the deep disposal well is inappropriate to address in the context of this IRA.

To the extent that the State desires a copy of the report, it should submit a written request to Mr. David L. Anderson, U.S. Department of Justice.

2. While the State agreed to limit the Task 37 study area to the areas described in response to the State's specific comment number 1, this agreement was limited to the Task 37 contract award. The areas currently excluded from the Task 37 study area must be included as part of this Interim Action when the new contract is awarded.

Response: The abandoned agricultural and monitoring wells in areas currently excluded from the Task 37 study area will be included in a later phase of this IRA when the Army awards its new contract.

3. ARARs. All subsections of Section 5, Abandonment Regulations," including subsection (1), of the Revised and Amended Rules and Regulations for Water Well and Pump Installation Contractors must be included as an applicable regulation. The State regulations are more stringent than the federal regulations because State regulations are intended to protect all aquifers, unlike the federal regulations which only protect underground sources of drinking water.

Response: Subsection (1) of Section 5 of the cited regulations is not considered applicable to this Interim response Action (IRA). Subsection (1), titled "General", simply states the intended purpose of the substantive, technical well abandonment requirements which follow in Subsections (2), (3), and (4). Subsection (1) does not establish a standard, requirement, criteria, or limitation concerning a hazardous substance, pollutant, or contaminant. Nor does Subsection (1) require any identifiable action, unlike Subsection (2), (3), and (4).

In analyzing the relative stringency of federal and state regulations which are undergoing consideration as potential ARARs, the critical aspects examined by the Army were the technical well abandonment requirements and not the statements of intention contained in the differing regulations. In the context of the Abandoned Well Closure Interim Response Action the state and federal regulations were compared to determine which contained more stringent requirements for closing abandoned wells in the interests of determining which would provide greater protection of human health and the environment. The federal regulations, which contain provisions to prevent the movement of fluid into or between underground waters not contained in the state regulations and which contain more specific requirements concerning plugging, are considered more stringent than the state regulations and will be followed. The Army believes that by complying with the substantive requirements of the federal UIC regulations this IRA will attain a higher level of protectiveness than if state regulations were followed for this specific environmental action.

4. The State disagrees that the filing of a generic plugging and closure plan is sufficient documentation for well closures. The Army has already recognized that under some circumstances proper closure of a well may necessitate procedures which differ from those contained in this document and the Task 37 Technical Plan. The Army must supply the State with a well-by-well summary of how each well was properly closed.

Response: The Army will supply a final Task 37 report to each of the OAS members. A well-by-well record for all Task 37 work will be included as an appendix to the Task 37 report.

5. Information on all wells which have been located to date and all other historical and/or pertinent information must be made available to the parties and State. The State requests that this information be made available at the earliest possible date. The State reserves the right to request a field search and/or sampling of specific wells after it has had the opportunity to review the above-mentioned information.

Response: The Army provided a status report of its findings to the OAS at a 25 May 1988 meeting on Task 37. While the State, of course, may request additional work by the Army based on that information, it should be noted that the State was a participant throughout the development of the Army's abandoned well location/sampling methodology and concurred in this approach.